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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/866,587	05/30/2001	Takehiko Nakai	35.C15390	4941

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EXAMINER

AMARI, ALESSANDRO V

ART UNIT PAPER NUMBER

2872

DATE MAILED: 11/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/866,587

Applicant(s)

NAKAI, TAKEHIKO

Examiner

Alessandro V. Amari

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 13/10 is/are rejected.
- 7) ☒ Claim(s) 11, 12, 13/11, 13/12, 14, 15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8. 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07 July 2003 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2 and 4-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Ophey et al US Patent 5,694,247.

In regard to claim 1, Ophey et al discloses (see Figure 1, 2) a diffractive optical element, comprising a grating structure (4, 5) having a first blazed type grating portion (11, 12) and a second blazed type grating portion (16, 17) which is arranged on a light exit side of the first blazed type grating portion as described in column 4, lines 5-7, wherein in at least one of the first type grating portion and the second blazed type grating portion, structures smaller than a used wavelength are arranged in a periodic manner as described in column 4, lines 10-45 and lines 63-66.

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Regarding claim 2, Ophey et al discloses a diffractive optical element, wherein said diffractive optical element is structured such that within an entire region of used wavelengths, diffraction directions are made different from each other, depending upon a polarization direction of a light beam incident on said diffractive optical element, and a diffracted light is concentrated only to one predetermined diffraction order as described in column 4, lines 62-67 and column 5, lines 1-10.

Regarding claim 4, Ophey et al discloses that said diffractive optical element has a step-shaped grating portion as shown in Figure 2.

Regarding claim 5, Ophey et al discloses that the minute periodic structure of the grating portion is varied along the periodic direction of the grating portion as shown in Figure 4B and as described in column 5, lines 35-46 and as shown in Figure 7.

Regarding claim 6, Ophey et al discloses that said minute periodic structure varied along the periodic direction of said grating portion is varied every step of the grating stepped portions as shown in Figure 7.

Regarding claim 7, Ophey et al discloses that the minute periodic structure of the grating portion is varied in a grating thickness direction as shown in Figure 7.

Regarding claim 8, Ophey et al discloses that the minute periodic structure varied in the grating thickness direction is varied every step of the grating stepped portion as shown in Figure 7.

Regarding claim 9, Ophey et al discloses that said used wavelength range corresponds to a visible light range as described in column 4, lines 9-12 and column 7, lines 53-67 and column 8, lines 1-30.

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Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-10 and 13/10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda et al US Patent 5,956,302 in view of Danziger et al US Patent 6,292,297.

In regard to claim 1, Maeda et al teaches (see Figure 1, 5, 14) a diffractive optical element, comprising a grating structure having a first grating portion (7a) and a second grating portion (7b) which is arranged on a light exit side of the first grating portion, wherein in at least one of the first type grating portion and the second blazed type grating portion, structures smaller than a used wavelength are arranged in a periodic manner as described in column 10, lines 55-57.

Regarding claim 2, Maeda et al teaches (see Figure 14) that said diffractive optical element is structured such that within an entire region of used wavelengths, diffraction directions are made different from each other, depending upon a polarization direction of a light beam incident on said diffractive optical element, and a diffracted light is concentrated only to one predetermined diffraction order as shown in Figure 14 and as described in column 11, lines 13-25.

Regarding claim 9, Maeda et al teaches said used wavelength range corresponds to a visible light range as described in column 11, lines 10-12.

Regarding claim 10, Maeda et al teaches (see Figure 14) a polarization converting element, wherein deflecting means is provided so that an emergence direction of one of a P-polarized light beam and an S polarized light beam which has undergone polarization-separation to be diffracted in a diffraction direction different depending on a polarization direction by said diffractive optical element is made substantially coincident with an emergence direction of the other beam as shown in Figure 14 and as described in column 11, lines 13-24.

Regarding claim 13, Maeda et al teaches (see Figure 5) an optical member (3) is provided so that an incident direction of a light beam on said diffractive optical element is made substantially parallel to an emergence direction thereof.

However, in regard to claim 1, Maeda et al does not teach that the first and second grating portions are blazed or in regard to claim 3 that said minute periodic structure is constituted by one kind of material, or two kinds of materials, and occupation ratios of the respective materials within one period of said minute periodic structure are made different from each other along a periodic direction of said grating portion or in regard to claim 4, that said diffractive optical element has a step-shaped grating portion or in regard to claim 5, that the minute periodic structure of the grating portion is varied along the periodic direction of the grating portion or in regard to claim 6 that said minute periodic structure varied along the periodic direction of said grating portion is varied every step of the grating stepped portions or in regard to claim 7, that the minute periodic structure of the grating portion is varied in a grating thickness

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direction or in regard to claim 8, that the minute periodic structure varied in the grating thickness direction is varied every step of the grating stepped portion.

In regard to claim 1, Danziger et al does teach that the grating portions are blazed as shown in Figures 2a, 2b.

Regarding claim 3, Danziger et al teaches that said minute periodic structure is constituted by one kind of material, or two kinds of materials, and occupation ratios of the respective materials within one period of said minute periodic structure are made different from each other along a periodic direction of said grating portion as described in column 2, lines 1-57, column 5, lines 11-67 and column 6, lines 1-31.

Regarding claim 4, Danziger et al teaches that said diffractive optical element has a step-shaped grating portion as shown in Figures 2a and 2b.

Regarding claim 5, Danziger et al teaches that the minute periodic structure of the grating portion is varied along the periodic direction of the grating portion as shown in Figures 2a, 2b and as described in column 2, lines 1-57, column 5, lines 11-67 and column 6, lines 1-31.

Regarding claim 6, Danziger et al teaches that said minute periodic structure varied along the periodic direction of said grating portion is varied every step of the grating stepped portions as shown in Figures 2a, 2b and as described in column 2, lines 1-57, column 5, lines 11-67 and column 6, lines 1-31.

Regarding claim 7, Danziger et al teaches that the minute periodic structure of the grating portion is varied in a grating thickness direction as shown in Figures 2a, 2b

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and as described in column 2, lines 1-57, column 5, lines 11-67 and column 6, lines 1-31.

Regarding claim 8, Danziger et al teaches that the minute periodic structure varied in the grating thickness direction is varied every step of the grating stepped portion as shown in Figures 2a, 2b and as described in column 2, lines 1-57, column 5, lines 11-67 and column 6, lines 1-31.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the blazed grating portions as taught by Danziger et al in the diffractive optical of Maeda et al in order to optimize overall diffraction efficiency of the diffractive optical element.

Allowable Subject Matter

6. Claims 11, 12, 13/11, 13/12, 14 and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. Claim 11 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, "a half-wave plate is provided in correspondence to one of a P-polarized light beam and an S-polarized light beam, which has undergone polarization-separation to be diffracted in a direction different depending upon polarization direction" as set forth in the claimed combination. Claims 13, 14 and 15 are also allowable since they are dependent on claim 11.

Claim 12 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, "diffractive optical element according to claim 2 is

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made substantially coincident with an emergence direction of the other beam and a half-wave plate is provided in correspondence to one of the P-polarized light beam and S-polarized light beam" as set forth in the claimed combination. Claims 13, 14 and 15 are also allowable since they are dependent on claim 12.

Claim 14 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, "toward modulating means for modulating the light beam on the basis of an image signal and the light beam modulated by said modulating means is projected onto a predetermined surface by a projection optical system" as set forth in the claimed combination. Claim 15 is also allowable since it is dependent on claim 14.

The prior art of record, Ophey et al, Maeda et al and Danziger et al teach a diffractive optical element comprising a grating structure having a first blazed type grating portion and a second blazed type grating portion which is arranged on a light exit side of the first blazed type grating portion, wherein in at least one of the first type grating portion and the second blazed type grating portion, structures smaller than a used wavelength are arranged in a periodic manner wherein the diffraction directions are made different from each other depending upon the polarization diffractions of the incident light beams and wherein the minute periodic structure has a step shaped grating portion that can be varied every step of the step shaped portions and that the emergent light of one of the polarized light beams is made substantially coincident with an emergence direction of the other beam and further comprising an optical member provided so that an incident direction of a light beam on said diffractive optical element

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is made substantially parallel to an emergence direction thereof and there is no motivation or teaching to modify this difference as derived.

Response to Arguments

8. Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Maeda et al US Patent 5,278,817 also teaches a diffractive optical element having a first grating portion and a second grating portion which is arranged on a light exit side of the first blazed type grating portion, wherein in at least one of the first type grating portion and the second blazed type grating portion, structures smaller than a used wavelength are arranged in a periodic manner as shown in Figure 7, 31a-c and 32 and as described in column 17, lines 16-31. Ohuchida et al US Patent 5,015,835 also teaches a diffractive optical element having a first grating portion and a second grating portion which is arranged on a light exit side of the first blazed type grating portion, wherein in at least one of the first type grating portion and the second blazed type grating portion, structures smaller than a used wavelength are arranged in a periodic manner as shown in Figure 1, 9b, 12b, 25 and as described in column 31, lines 27-56. Also, Komma et al US Patent 5,400,311 teaches varying the period of a step shaped grating portion in order to improve the diffractive efficiency of a grating.

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10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alessandro V. Amari whose telephone number is (703) 306-0533. The examiner can normally be reached on Monday-Friday 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on (703) 305-0024. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

ava *av*
07 November 2003


MARK A. ROBINSON
PRIMARY EXAMINER